The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

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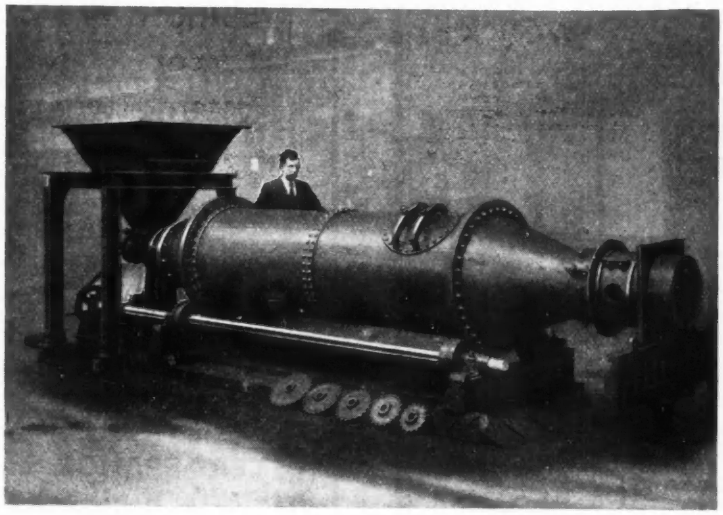

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The Chemical Age

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War-Time Fuel Conservation

THE reduction of operating costs is a major concern of chemical engineers. Since, after the last war, we changed from being a cheap-coal country to a dear-coal country, fuel costs have taken an important place in the balance sheet of most large-scale chemical processes. Nearly all chemical processes require fuel for one purpose or another; in some the cost of fuel is a high percentage of the total cost of production; in other processes it is dwarfed by other costs. The attention paid to fuel in the chemical industry therefore depends to some extent upon the place which it occupies in the economics of any particular process. So long as we were at peace industry could be allowed to take its own time to make its plant efficient, but the exigencies of war transport and of man power now demand that immediate steps be taken to improve the efficiency of fuel utilisation wherever possible in order to reduce the amount of coal consumed.

The Fuel Efficiency Committee set up by the Mines Department has just concluded a series of three joint meetings of the ten senior technical societies, at which the subject of fuel conservation has been thoroughly discussed in order to devise the best ways and means of improving the efficient use of fuel and power in existing industrial plants under present conditions. The Committee, as a result of a survey, has concluded that the minimum amount of fuel which it should be able to save by improving the operation of industrial fuel-using plants is in the neighbourhood of 10 million tons. This is made up of 4½ million tons in the generation of steam and power; 4½ million tons in the utilisation of process steam and power; and 1 million tons in transport largely consequent upon the initial saving of 9 million tons. In some quarters it is believed that these figures can be doubled. Among the technical bodies present at the meetings were the Society of Chemical Industry, the Institution of Chemical Engineers, and the Institute of Chemistry. The presence of these bodies is an indication of the importance which is being attached to fuel in the chemical industry.

The difficulty of further improving the efficiency of fuel utilisation in many industrial undertakings is shown by the fact that although, during the years 1913-38, the population increased by 10 per cent., industrial fuel-using processes increased considerably, and road motor-vehicles increased from 150,000 to 3,000,000, the total increase in fuel consumption of the country was only 4 per cent., an indication of the economy that has been secured during the period. Nevertheless, the discussions indicated abundant evidence that a great many plants are not operated at anything like the efficiency that should be secured. There is much to be done and it is the task of fuel engineers and of chemical engineers and process engineers generally to see that it is done well and quickly. It has been made abundantly clear that the basic problem is administration. There may be repairs required to plant, it may be necessary to extend existing plant, it may be necessary to alter existing practice, but to all these changes there may well be opposition from those who are satisfied to continue in the future as they have done in the past, unless the higher management from the Board of Directors downwards gives the programme of fuel conservation its blessing. Basically, then, the conservation of coal must start at the top. The Ministry of Mines is doing what it can to bring this about, but it is engineers generally who must leaven the whole body of industry and who must persuade their managements that what is demanded by the Ministry of Mines is both possible and profitable.

The chemical industry uses boilers to a very considerable extent. Frequently, these are of the Lancashire or Economic type and in larger works the water-tube type is often used. Many coal users, such as power stations, gas works, ships and locomotives, are already as efficient as they can be expected to be without complete rebuilding, and the same applies to many, but by no means all, furnaces. Furnaces are too often kept on full gas even when empty, and there are many directions in which a qualified fuel technologist can save fuel in ways unexpected to those who are continually engaged in normal process work. Industrial steam raising plant is held by many to be at the root of the problem because it is the one type of plant that can be made to operate somehow with unsuitable coals. It is here that the relative efficiency is the poorest, largely, as has been pointed out previously, because the boiler plant is a side-line in most steam-using industries.

The principal reasons for inefficient coal utilisation in industrial steam plant are: (1) inadequate draught; (2) inadequate heat-recovery apparatus; and (3) the wastage of steam in conveying it from boiler to process and in the process itself. Chemical engineers do not need to be told that if more coal is fed on to a furnace, more oxygen must be provided; hence the necessity for adequate draught. This can be secured either by chimney or by fans. Far too many boiler plants have no economisers, and an instance was quoted in one of the discussions of a 12-boiler plant with a stack temperature of 600° C. Economisers are important adjuncts to efficiency in themselves, and since they remove any unusual surplus of heat that there may be, due to improper firing, they are a useful check on temporary inefficiencies. The practice of using steam jets to increase the draught is not good, unless the jets themselves are very carefully watched, as they become enlarged in use.

NOTES AND COMMENTS

Chemists and Furnace Operation

ONLY last month Mr. G. W. Read-Baker commented on the fact that the knowledge of chemists was not fully utilised in the engineering problems of the paint industry, as noted in THE CHEMICAL AGE on December 20. Now Dr. E. W. Smith makes a similar criticism about the fuel industry. In a letter to the *Manchester Guardian* he suggests that chemists should be employed as "gas chasers" in industrial concerns where the question of fuel economy must now take a prominent place. From personal observation in visiting a large number of works he has noticed that managements are not using their chemists in such a way as to get the best out of them. "The chemist," he contends, "should be to the furnace-user a service department available to give advice and criticism, but without functioning as the furnace operator. Only by the closest collaboration between such a service department and the furnace operator can the best be obtained from furnaces, and it is for the departmental management to see that a balanced view is taken, as to-day no fuel economy is justified which interferes with either quality or production." Production departments to-day are fully convinced of the importance of fuel economy and are encouraging the appointment on all large works of "gas chasers" who would, by securing the proper operation of existing furnaces and by exercising reasonable administrative control, effect considerable economies. They can call for technical advice either through their own chemical staff or the industrial centres attached to the gas industry. The men controlling these centres are in the main trained chemists, and already material reductions in fuel consumption have been attained by putting into practice the policy outlined.

Coal Delivery and Fuel Economy

FUEL economy is not assisted by the considerable inconsistency now to be found in the quality of coal deliveries. This is in the main due to the difficulties in transport, but it is widely felt in industry that the Mines Department is not blameless. There seems to be a lot of unnecessary complication introduced into works management owing to an apparent lack of knowledge of coal and its properties on the part of those whose business it is to see that industry gets the right type of material. Some surprising stories are heard of the complete unsuitability of deliveries of coal sent or offered to works. An instance to which reference was made in the recent discussion on Efficiency in the Use of Fuel was of a gas producer plant in South Wales which, in successive deliveries, was supplied first with bituminous coal having a volatile matter content of 31 or 32 per cent. and then with a load of pure anthracite. It seems difficult to understand how it is that these extraordinary mistakes should arise, and arise as frequently as they do, if the officials of the Ministry of Mines who are responsible for the allocation of coal know anything of the material with which they are dealing, understand anything of the processes for which coal is being supplied, or have any interest in their work.

The Scientific Workers' Conference

ANY complacency that may have so far survived concerning the proper employment of scientific talent in war-time in this country must have been removed by the findings of the recent conference convened by the Association of Scientific Workers. The speakers assembled last week-end at the Caxton Hall, Westminster, left no doubt that in their opinion the waste of scientific ability was outrageous, and a great amount of healthy full-blooded criticism was levelled at the authorities for their remissness in co-ordinating scientific and technical knowledge in the national effort. Professor Bernal claimed that the British Association's conference of last year ended on too complacent a note; Professor Levy demanded better positions for scientific men in the services and the creation of a "planned economy"; Mr. R. E. Foster, speaking with experience as a technical assistant in a war factory, said that a general feeling of frustration permeated all classes of workers, who were prevented from producing by mismanagement and inefficiency in high places; and so on. In our view this criticism is perfectly justified, but it has the demerit of being almost purely destructive. To formulate a constructive plan for the fuller employment of scientific ability is a heroic task, perhaps even an impracticable one in the middle of a war. If we had had such a plan, the probability is that there would never have been a war at all—but that is another story. The great thing about the conference is that it undoubtedly ventilated certain abuses, which will therefore be gradually cleared up, in the piecemeal British way. Other sessions of the conference dealt with building, housing, and A.R.P., and with food and agriculture. Sir John Orr and Dr. Sinclair had some pertinent things to say about nutrition, and the inter-allied food-planning committee mooted by Dr. Sinclair is a really constructive suggestion, which we hope to see followed up.

American TNT Production

DEFENCE needs for TNT explosives are being supplied in the U.S.A. for the most part from toluene made by the petroleum industry, in plants now operating or to come into operation within a few months, according to Dr. Gustav Egloff, a leading oil scientist. Although this planned production of toluene is already more than three times as great as the normal output, plants should be built now to double the output. The annual production of toluene from the plants now operating and under construction totals 100 million gallons, enough to make 1000 million lb. of TNT, he declared, with 70 million gallons coming from petroleum and only 30 million from coal carbonisation, hitherto the normal method of making this principal ingredient of TNT. Any further expansion in toluene production should also come from petroleum rather than coal, Dr. Egloff asserted. Toluene from coal carbonisation is strictly a by-product, and the yield is only 3 lb. per ton of coal. On the average, selected gasoline fractions yield 50 per cent. of toluene, he said, with a few giving as much as 80 per cent. in the laboratory. Two principal methods, extractive and catalytic, are available for the manufacture of toluene from petroleum (*see* THE CHEMICAL AGE, 1940, *43*, 1107, p. 121). Certain crude oils contain enough toluene for it to be separated commercially merely by an extension of the basic petroleum refining method, straight distillation or extraction. Much greater yields can be obtained, however, by the chemical conversion or synthesis of toluene from certain gasoline fractions of petroleum. The gasoline molecules obtained by distillation and cracking are further processed to cause a chemical alteration, resulting in toluene.

Increasing Explosives Output

THE largest petroleum plant manufacturing toluene, with estimated annual production of 30 million gallons, employs this catalytic method. A number of smaller catalytic plants, with about the same total combined output, are being built. Several plants using the extractive process have a total production of 10 million gallons. Dr. Egloff reported that the other ingredients of TNT can also be obtained readily from petroleum, and that there is no reason why new refining plants cannot be built for the complete manufacture of TNT from petroleum. Raw materials from petroleum also are being used, and can be used in increasing quantities if necessary, in the manufacture of other common explosives such as trinitroglycerin and the trinitrophenols. One refinery is already making trinitroglycerin on a commercial scale, he said. Doubling the present production, so that 200 million gallons of toluene were made from gasoline, would have little effect on the supply of motor fuel, he asserted, because this huge amount of toluene, enough to make 2000 million pounds of TNT, would be less than 1 per cent. of the United States annual production of more than 25,000 million gallons of motor fuel.

(*Contents appears on p. 1*)

Applications of Molecular Distillation, I

Commercial Production of Vitamin A

by D. D. HOWAT, B.Sc., A.I.C., A.Inst.M.M., Ph.D.

APPLICATIONS of the process of molecular distillation have expanded greatly, directly in commercial products, and in research as a means of separating and identifying vitamins. The first commercial application was the production by Metropolitan Vickers Electrical Co., Ltd., of hydrocarbon oils of high molecular weight for use in diffusion pumps and of vacuum greases possessed of very low vapour pressures (Apiezon products). These products have played a large part in the perfecting of demountable cathode tubes and X-ray tubes. The other important development has been the commercial production in quantity of high grade vitamin concentrates and esters.

Distilled vitamin-A alcohol was first produced on the commercial scale in 1932 by the British Drug Houses, Ltd., using the small continuous still described in the Society of Chemical Industry's symposium in 1939. In 1936 the same company prepared vitamin-A ester concentrates by distilling fish-liver oils in a single stage all-metal still also described in the symposium. Both stills were designed by Metropolitan Vickers, the design being based on work on vitamin distillation in which I.C.I., Metropolitan Vickers, and British Drug Houses collaborated. When the capacity of the small continuous still was no longer adequate for vitamin-A alcohol production, large cyclic stills of Hickman's design were installed. Within the past seven years Distillation Products Inc., of Rochester, N.Y., have been preparing vitamin-A esters on a very large scale.[21] They have also produced quantities of concentrates of vitamin E. Dr. K. C. D. Hickman has directed extensive investigations into the nature, identity, and testing of the vitamins.

Vitamin A

Vitamin A, occurring entirely in the animal kingdom, is derived by metabolic processes from carotene, a constituent of most green plants and seaweeds. The oils from the livers and viscera of fish constitute the main commercial sources of vitamin A. In the raw state these oils have a highly unpleasant taste and odour, and contain only relatively small amounts of valuable vitamins; the medicinal value of these oils and the possibility of blending them with other materials to enrich foodstuffs is therefore limited. Molecular distillation has afforded a method of removing the constituents causing the unpleasant taste and odour and of concentrating the vitamins in a palatable and stable form. On subjecting the fish oils to molecular distillation, the primary fractions to distil (amounting to just a little over 3 per cent. of the original oil) contain the free fatty acids and the constituents responsible for the unpleasant taste and odour. Vitamin A, in the ester form, is found to concentrate in the next fractions, constituting about 5 per cent. of the original. These fractions also contain some vitamin D together with sterols and natural anti-oxidants. A final, less potent fraction, amounting to about 10 per cent. of the original oil, is taken in order to recover the whole of the vitamins. About 80 per cent. of the original oil is recovered as a bland residue from which all free fatty acids, vitamins, and odorous substances have been removed.

Distillation Products market a standard concentrate of distilled natural vitamin-A esters containing 200,000 U.S.P. XI units per gram. A special concentrate having a potency of 500,000 U.S.P. XI units per gram is also available. The high stability of the standard concentrate is shown by the fact that only 15 per cent. of the initial vitamin is destroyed during 30 hours constant aëration at 45° C. The advantages claimed for these concentrates are:—high stability; blandness; uniform purity, colour and clarity; and uniform potency and high biological activity.

Before outlining some of the research work appearing in published papers some explanation must be given of elimination curves and their function in research work on vitamins. The boiling point has long been a criterion both of the identity and purity of organic substances. Such a simple test cannot be applied to substances treated by molecular distillation. The boiling point, as commonly defined, marks the temperature at which the vapour pressure of the liquid becomes equal to the superincumbent pressure of the atmosphere. Below this temperature distillation will not take place, above it evolution of vapour occurs rapidly, the transition point being well-defined and obvious. These conditions do not apply in molecular distillation, where, in the absence of foreign gas molecules, evaporation occurs whenever there is a temperature gradient between the evaporating and condensing surfaces. Further, almost all substances treated by molecular distillation are highly thermo-labile, decomposing rapidly at temperatures far below the boiling point. Hickman[22] has shown that it is possible to systematise the course of molecular distillation so that a property of the constituents of the liquid, analogous to the boiling point, may be measured. In this way, molecular distillation may be used as an analytical tool. The procedure makes it possible to determine the relative boiling points of the two constituents, their relative heats of evaporation, and the relative purity of single substances. A further advantage of the method is that these data may be obtained for substances in dilute solutions of unknown concentration. This is particularly valuable in the case of certain vitamins, sterols, or hormones which have not hitherto been obtained pure.

The main feature of Hickman's method is the determination of the "elimination curve" for the specific substance. The theory of the elimination curve is based on

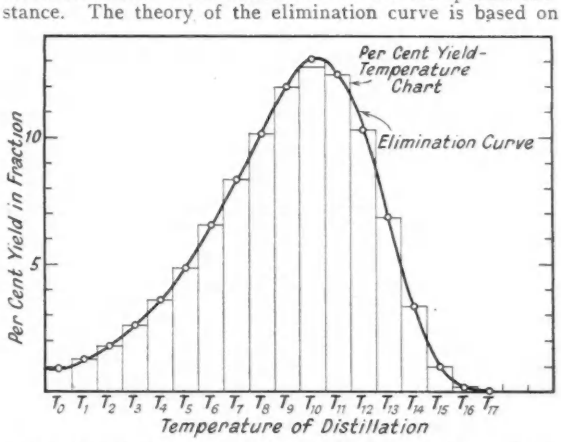


Fig. 13. Yield vs. temperature chart, and elimination curve

the assumption that when a solution of a volatile component i na much less volatile liquid is passed through a still, the quantity of the volatile component evaporated at any moment will be proportional to its mole-concentration in the main bulk of the solution. To determine the elimination curve the solution is passed repeatedly through a cyclic still at a constant rate, the temperature being raised by definite increments at each cycle. If the amount of the volatile component in each fraction is determined and plotted against the temperature a symmetrical curve of the type shown in Fig. 13 is obtained. The curve passes through a maximum on the temperature axis, a value which may be shown on theoretical grounds to be characteristic of the given volatile component. The exact shape of the elimination curve so determined is fixed by the procedure employed, the general form of the

curve remaining constant. The curve is significant because its form is independent of the kind of substance distilled. Further, if an experimentally derived curve differs from the normal the reason may be in: (a) faulty distillation; (b) departure of the behaviour of the substances being distilled from the ideal behaviour assumed in deriving the theory of the elimination curve; or (usually the most likely reason) (c) the presence of a mixture of substances answering to a single identification test. The curve has proved of very great value in the application of molecular distillation to the separation and identification of various vitamins. The maximum on the curve may be located with an accuracy of ± 1° C. and is quite as definite a characteristic as the boiling point.

Frequently a natural fish oil will contain a number of vitamins or other potent materials, the elimination curves showing a number of maxima. To assist in the identification of these different materials certain types of dye have been employed, whose elimination curves correspond very closely to those of the vitamin, the dyes acting as "distillation pilots." For example, if an oil containing vitamins A and D mixed with traces of celanthrene red and methyl indigo is treated in a molecular still, the reddest tractions obtained are those containing the maximum of vitamin A and the bluest fraction the maximum of vitamin D.[23]

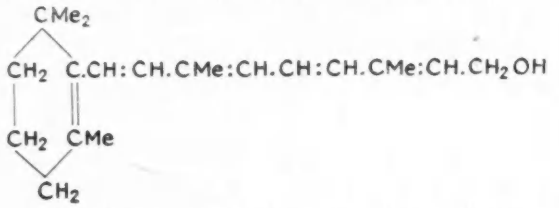
As a further step in the analytical technique applied in molecular distillation, Hickman and his collaborators have prepared a series of "constant-yield oils"[22, 24] by blending various non-reactive solvents such as heavy petroleum fractions. In using molecular distillation to identify constituents, the material under examination is dispersed in a medium which yields a similar volume of distillate for each succeeding temperature interval without reducing the total volume of the liquid by more than one half at the end of the distillation. This method has proved of great value in analytical distillation. Without the use of constant-yield oil the recovery of traces of substances from non-volatile liquids is exceedingly difficult. The small traces of distillate collect as a mist on the condenser and in order to remove them distillation must be stopped and the condenser rinsed with a suitable solvent. The more convenient method is to allow the liquid to evaporate with the more volatile constituent. Evaporation does not, however, take place at a uniform rate, some fractions being large and others small. To counteract this defect and allow more rapid distillation and easy collection of the volatile constituent, the constant-yield oils are employed. A mixture of synthetic glycerides functioning as constant-yield oils has proved most satisfactory for sterols, vitamins, and hormones, being suitable for oil-soluble dyes and readily assimilated by animals during the biological assays.

Elimination Curves and Chemical Constitution

The temperature of the maximum on the elimination curve offers very valuable data in determining the constitution of the substance. Hickman and Gray[25] found from a study of the amino-anthraquinone dyes that methylene groups in a side-chain contribute to raising the maximum elimination temperature by 4½ to 5° C. for each group present. The elimination maximum of each member of a homologous series is approximately 5° C. higher than the one preceding it.

Further work has been carried out by Gray and Cawley[26] on the effect on various types of unsaturation on the elimination maximum. Working with lauric, myristic, palmitic and stearic acids which have elimination maxima in approximately the same region as vitamins A and A_2, these two investigators confirmed that the addition to a compound of one methylene group raises the maximum by 5°, and showed that each conjugated double bond raises the maximum by 3° above that of the corresponding saturated substance, while each double bond which is not conjugated lowers it by 2°. The necessary evidence was provided by the elimination curves of stearic, oleic, linoleic, 9,11-linoleic and α-elæostearic acids.

Although a primary alcohol, vitamin A most commonly occurs in nature esterified with long-chain fatty acids. The crystalline dimaleic anhydride adduct of vitamin-A palmitate was first isolated from a fish liver oil by Hamano.[33] Later the same compound was obtained from cod-liver oil by Tischer[10]. No crystalline esters have so far been isolated from natural sources, but the following synthetic esters have been obtained in crystalline form: anthraquinone-2-carboxylate, 2-naphthoate[41, 42], and palmitate.[27] The formula generally assigned to vitamin A is:



Vitamin-A potency may be estimated by tedious and costly biological assay or by physicochemical methods. The method which is often considered to be the most exact depends upon the measurement of the absorption of ultraviolet light at the maximum (328 mμ) of the vitamin-A absorption band of a solution of the material to be tested or a purified extract. Pure vitamin A has an extinction coefficient—$E^{1\%}_{1cm.}$ 328 mμ of about 1800.[29, 30, and 27] The second method, almost as exact, rests upon the absorption of light at the maximum (620 mμ) of the absorption band of the blue-coloured reaction product formed by mixing a chloroform solution of the material with ten times its volume of a saturated chloroform solution of antimony trichloride. Exposure of solution of vitamin A to ultraviolet light causes rapid loss of potency; even daylight has a serious effect which may be minimised, as Embree[28] as shown, by using amber glassware.

Alcohol Purification

The purification of vitamin-A alcohol by molecular distillation was first described by Heilbron, Heslop, Morton, Webster, Rea, and Drummond,[43] who stated that the distillation was carried out by Dr. F. H. Carr and W. Jewell of the British Drug Houses, Ltd. In the following year Carr and Jewell[44] described the preparation of a distillate having a high extinction coefficient of $E^{1\%}_{1cm.}$ 328 mμ = 1600. Crystalline vitamin-A alcohol was first prepared by Holmes and Corbet[29] using fractional freezing-out of a solution in methyl alcohol of the non-saponifiable matter from a rich fish-liver oil. Similar crystals were obtained by direct crystallisation of molecularly distilled vitamin-A alcohol by Mead, Underhill, and Coward,[30] who pointed out that crystals obtained in this way probably contained solvent of crystallisation. Unsolvated crystals of the vitamin were first prepared by Baxter and Robeson.[27] These authors distilled rich fish-liver oils in a cyclic still and obtained concentrates of the natural esters having extinction coefficients at 328 mμ of 400 or greater. The ester concentrates were saponified to yield vitamin-A alcohol which, after redistillation if necessary, could be crystallised from ethyl formate solution at −35° C. The pale yellow prismatic needles of vitamin-A alcohol after being dried in vacuum at a low temperature were obtained free from solvent. The melting point of the unsolvated crystals was 63-64°, whereas the crystals containing methyl alcohol of crystallisation previously obtained by Holmes and Corbet and later by Mead melted at 7-8°. A modification of vitamin A produced by Castle, Gillam, Heilbron, and Thompson [31] from the action of HCl on vitamin A in alcohol was very similar to the original vitamin but differing in the absorption maxima. This substance is known as cyclised vitamin A, although the formula proposed for it has not yet been established by synthesis.

Using molecular distillation to treat samples of halibut-, pollack-, and cod-liver oils, Embree[32] has shown that cyclised vitamin A occurs naturally in these fish oils, sometimes to a concentration of about 2 per cent. of the vitamin-A content. Cyclised vitamin A appears to have no growth-promoting power.

Another modification of vitamin A, commonly described

as vitamin A_2, has been found to occur in liver oils from certain freshwater fish. Although it is closely similar in general properties to vitamin A, a difference lies in the values obtained for the absorption maxima. The exact constitution of vitamin A_2 relative to vitamin A has been the subject of a good deal of research work. Gillam, Heilbron, Jones, and Lederer[33] concluded from the absorption data that vitamin A_2 contains six conjugate double bands. Gray[34] suggests that useful information on the constitution of the two substances may be obtained from a comparison of the molecular distillation elimination curves: if the compounds are homologous, the temperatures of the elimination maxima should be separated by 9 to 10° C.,[25] while if they differ only in a degree of saturation (*i.e.*, by two hydrogen atoms) the temperature difference between the elimination maxima should be considerably less. The comparison was made in a single distillation, Atlantic salmon-liver oil being the source of the two vitamins. Comparison of the elimination curves of the two substances with one another and with celanthrene red 3B, proved that the temperature of the elimination maximum of vitamin A_2 is only 3° C. above that of vitamin A. The evidence indicates that the molecules of the two vitamins contain the same number of carbon atoms, differing only in the degree of saturation: vitamin A_2 has six double bonds in conjugation instead of the five in the commonly accepted formula for vitamin A.

Vitamin A_2 may be cyclised, forming a material which closely resembles cyclised vitamin A. Methods for the cyclisation of vitamin A_2 have been advanced by Embree and Shantz,[35] who give the absorption maxima in the spectrum together with an account of the adsorption of the material by alumina, and an outline method for estimating the relative amounts of vitamins A and A_2 by the chromatographic separation of their cyclised derivatives.

A further application of the elimination curve technique to the study of vitamin-A absorption is furnished in the work of Gray, Morgareidge, and Cawley.[36] Vitamin A occurs naturally in the esterified form, but comparatively little is known of the mechanism of absorption of the vitamin from the intestine. Groups of selected rats were killed off at definite periods after being given doses of vitamin-A esters by stomach tube, and the total vitamin-A alcohol in the gut contents and washings was determined by molecular distillation. This process enables a clear distinction to be made between vitamin-A alcohol and natural vitamin-A esters. Under the conditions used for analytical distillation the elimination maximum of the alcohol is at about 120°, while the maximum of the esters lies above 200°. The results showed that vitamin-A esters behave like other esters of the fatty acids, becoming hydrolysed in the intestinal tract by the enzymes in the juice. During the height of absorption, the vitamin within the gut wall exists mainly in the unesterified form, so showing that the esters as such are not directly absorbed from the lumen into the blood.

(To be concluded.)

Limitation of Supplies

Retention of Records

SUPPLIES in future periods of restriction will, it is expected, be computed by reference to those standard periods which are at present in force under the various Limitation of Supplies Orders. Accordingly, the Board of Trade, after consulting the Controller of Salvage, recommends that, when scrapping papers for salvage, traders should take care to keep all accounting records, invoices, etc., relating to their business operations from April 1, 1939, onwards, which may be of use in the calculation of their quotas under the current and future Orders.

The decree prohibiting the establishment of new salt-producing plant in Germany has been extended for another three years, as the capacity of existing works is only partly utilised.

Mustard Oil Explosion

An Unexplained Accident

A HAZARD hitherto unreported in the literature was revealed by the explosion of an autoclave containing allyl isothiocyanate (oil of mustard) in the plant of The Edwal Laboratories, Inc., Chicago, on February 11, 1941. Four persons were killed and considerable damage was done according to a report in the *A.C.S. News Edition* (1941, *19*, 23, p. 1408).

The process in use consisted of reacting ground sodium thiocyanate and allyl chloride in a 100-gallon autoclave with stirring and occasional heating by means of the steam jacket. The operating pressure was held below 80 lb. The autoclave had been designed for 2000 lb. pressure, had been tested when purchased at 1000 lb., and was equipped with a 0.75-inch safety valve set at 900 lb. and an alarm bell set to ring at 80 lb. The equipment and identical process had been in use for about two and a half years.

On the afternoon of the explosion the reaction had been practically completed; steam had been off for some time and the pressure gauge was standing at 70 lb. about three minutes before the autoclave ruptured. The rupture was violent, indicating a sudden high internal pressure. The contents flashed into a flame front which was responsible for additional damage.

No explanation has been found for the explosion. The safety valve, when recovered from the debris, was found to be in working order. Only slight evidence of kettle corrosion was found. Nothing unusual was shown by analyses of the remaining stock of allyl chloride and sodium thiocyanate. Moreover, two previous batches of mustard oil had been made from this same stock without incident.

Tests made by heating mustard oil in sealed glass ampoules showed that at 250° C. a carbonaceous-appearing residue and high pressure were produced. In some unknown way a side reaction may have been initiated which generated enough heat to cause this decomposition in the autoclave. One theory advanced was that peroxides may have been present which initiated polymerisation of the allyl group, resulting in unduly high temperature. However, the remaining stock of allyl chloride was shown to be peroxide-free. Benzoyl peroxide did not accelerate the decomposition of mustard oil when heated in sealed glass ampoules.

This unexplained explosion of allyl isothiocyanate should warn those who handle the substance at high temperatures that suitable precautions must be taken.

Chemical Matters in Parliament

Government Chemical Officers

IN reply to a question from Mr. Liddall, Mr. Harold McMillan, Parliamentary Secretary to the Ministry of Supply, gave the following information regarding the names, technical qualifications, firms with whom they were previously employed, and salaries of the seventeen senior officers with recognised chemical qualifications who are employed in functions of an administrative character in the Ministry of Supply. The names are as follows: L. W. McDavid, M.Sc., D.Sc., F.I.C., M.I.Chem.E.; R. C. Bowden, Ph.D., M.Sc., F.I.C., F.C.S.; G. P. Davies, B.Sc., Ph.D.; W. G. Hiscock, B.Sc., Ph.D.; A. R. V. Steele, A.I.C., M.I.Chem.E.; C. S. Robinson, M.A., F.I.C., M.I.Chem.E.; A. T. Sumner, B.Sc., A.I.C.; J. J. Fox, D.Sc., F.I.C.; J. Davidson Pratt, F.I.C.; W. H. Wheeler, B.A., D.I.C., Ph.D.; A. Mortimer, M.P.S.; J. Rogers, F.I.C.; J. W. Armit, M.A., B.Sc., Ph.D.; T. A. Smith, B.Sc., F.I.C., M.Inst.P., M.I.Chem.E.; R. C. Strathen, B.Sc., Ph.D.; E. Wheeler, F.I.C., A.C.G.I.; and F. C. Everett, A.I.C., A.R.C.Sc

Messrs. McDavid, Davies, Hiscock, Robinson, Rogers, Armit, and Strathern were formerly employed by I.C.I. Mr. Davidson Pratt was with the A.B.C.M., and Mr. Mortimer with the Wholesale Drug Trades Association; the remainder were civil servants. In the case of the ten paid from public funds, the salaries varied from £980 to £1750, all but two lying between £1000 and £1400.

CHEMICAL NEWS FROM THE DOMINIONS

Australia's Chemical Industry

Raw Materials for New Productions

THE first year of the war saw an increase in Australia's output of chemicals, drugs, and medicines by more than £A1,000,000, while paint production increased by £A400,000. The combined output of these two groups increased from £A11,260,000 to £A12,700,000, *i.e.*, by 13 per cent. Figures for the second war year are not available, but the expansion continued, if anything at a faster pace, owing to the necessity of curtailing imports (those of drugs, paints, and chemicals approached £A5,000,000 in the last year before the war) and of providing larger supplies for war needs.

An important factor in the recent expansion of chemical manufacture in Australia has been the policy of developing natural raw material sources in the Commonwealth. The Government helped by the appointment of a committee to investigate local mineral deposits and by the preferential treatment of indigenous motor fuel substitutes. The Council for Scientific and Industrial Research rendered assistance by concentrating on problems facing the local raw material industries, such as the flotation and concentration of non-metallic minerals, corrosion of metals under specifically Australian conditions, utilisation of wool wax and other by-products of the wool-scouring industry, development of tanning material from Australian plants, etc.

Activity Among Minor Metals

This official encouragement has no doubt been of great help, but the initiative in the most important developments arose from private quarters. The expansion of the steel industry in the Commonwealth and the erection of an entirely new steel and shipbuilding centre at Whyalla have provided a most valuable addition to the supply of coal-tar and other coke-oven by-products. The call for minor metals from ferro-alloy manufacturers has given a stimulus to the mining of scheelite, rutile, monazite sand, and antimony ore. The oil shale industry has been able to benefit from the reduction of petroleum imports, and barytes has received attention for similar reasons.

Potash is being extracted from the discarded residues of cement factories. The war-time shortage of ammonium sulphate has caused consumers to look around for other nitrogenous fertilisers. Sodium silicate is being made by a silicate and dolomite mining company. Local magnesite is the raw material of the first magnesium plant in New South Wales, which began operations before the earlier scheme for an aluminium refinery had borne fruit. In the meantime, however, the aluminium plans have also progressed so that the Commonwealth will soon possess an efficient light metal industry. Another raw material which may become the basis of an important chemical production are the pyrites found at various places in New South Wales, Queensland, and Tasmania. It is believed that comparatively small investments would permit a sulphur production sufficient for an extensive fertiliser industry.

Vegetable raw materials do not yet play a very important part in Australia's chemical industry, but there is a growing realisation of their vast possibilities. Several wood-pulp and newsprint factories are to be built and extended in Tasmania where eucalyptus timber provides a good raw material. In New South Wales wood is used on a substantial scale for the production of charcoal for gas producers. Experiments with surplus potatoes in Tasmania have not encouraged the belief that they can be used for the manufacture of alcohol, but it is intended to use them for the production of starch. Industrial alcohol is being obtained in three existing distilleries which are using molasses, and it has been suggested that to use raw sugar in addition would increase output. Silage from sugar-cane tops helps to overcome fertiliser difficulties.

Application of American "chemurgic" methods may provide such products as methanol, acetone, dextrine, maltose, sorbitol, and furfural from Australian surplus crops. It is proposed to make high-quality agar-agar from the seaweed *Gracilaria confervoides* which occurs in sufficient quantity to meet the entire local demand. Hyoscine and its derivatives, obtained from the corkwood tree, are already being exported in small quantities. Linseed is being planted in Western Australia to overcome the scarcity of paint oils. A very important raw material for chemical manufacture is wool and its by-products. A highly refined anhydrous lanoline is at present made by the Australian subsidiary of a British company, and other by-products may help greatly in the soap and grease industry.

Developments in South Africa

Use of Local Resources

CHEMICAL industries in the Union of South Africa underwent a rapid expansion in the years before the war, but official statistics released since show that most of this expansion was concerned with the working-up of imported raw materials and intermediates into finished products. The cost of materials used rose between 1933-34 and 1937-38 from £3,660,693 to £6,388,803, but the net output (*i.e.*, the value added to the cost of materials by work in the Union) increased only from £3,626,587 to £4,940,240, and the percentage share of local raw materials used in chemical factories hardly advanced at all.

Progress was limited mainly to the repacking and working-up of semi-finished products for immediate use in the Union. After the beginning of the war this branch of the Union's chemical production made further progress, but as far as concerns chemical raw materials and elementary products, the main change of the war was a change towards new sources of overseas supplies. The United States now provide the Union with much of the potassium compounds, sodium chlorates, flotation chemicals, and organic acid—to mention a few of the categories now required in larger quantities from U.S.A.—which formerly were obtained from the Continent of Europe.

More recently energetic efforts have been made for the production of chemicals needed by the Union's staple industries from local raw materials. Barytes is produced in larger quantities for the paint industry, bichromates are prepared for the tanning trade, sodium chlorate and mercury for mining explosives, and zinc sulphate for wood preservation.

Chemical production units have also been started to absorb surplus products from agriculture; the use of molasses for the manufacture of alcohol is a typical example. Attention has further been drawn to local materials by the increased interest shown for them by foreign consumers. South African chromites, pyrites, and antimony concentrates now meet with greatly increased demand. Shipments of magnesite to the United Kingdom have risen rapidly since the Greek source has been cut off. The South African magnesite is very similar to the Greek mineral in so far as it contains very little iron and silica.

By-Product Plants at Pretoria

An entirely new raw material base for the Union's chemical industry has been created by the establishment of an iron industry at Pretoria. The first coke-oven plant of 57 ovens has been augmented by a second battery consisting of 45 ovens which are capable of an output approximately one-quarter larger than the original plant. The intake of this second battery, which has only recently started operations, was stated to be 960 tons of coal daily. Further, a new ammonia plant is being installed, the benzol plant has been doubled and equipped for the manufacture of pure toluol, and a new continuous tar distillation plant has been added which will increase the road-tar capacity to some 2,000,000 gallons a year. South Africa offers a large market for chemical fertilisers, and while it is unlikely that the production of industrial coal-tar chemicals will be increased beyond the immediate needs of the mining industry, agriculture is likely to absorb readily all ammonium sulphate that can be provided from local manufacture.

General News——From Week to Week

One old newspaper salvaged equals three 25-pounder shell-caps; one popular magazine equals two mine interior components. Save paper and " Pack the nation's punch."

Copper mines in County Wicklow, Eire, which were worked during the war of 1914-18, are to be re-opened for the production of sulphate for the manufacture of fertiliser.

The Ministry of Supply has made arrangements to import supplies of asbestine into this country, and have appointed the Asbestine Importers' Association, Ltd., 40 Chapel Street, Liverpool, 3, as distributing agents.

We acknowledge the receipt this week of a most attractive calendar—each month illustrated with a photograph of one of Britain's waterfalls—from Messrs. Rhodes, Brydon & Youatt, Ltd., manufacturers of the " Mopump," to whom we are most grateful for this useful gift.

When Mr. E. Brown, Minister of Health, was asked in the House of Commons last week whether he was satisfied that adequate provision was being made for essential supplies of phenol and its homologues to be available for the medical services, he replied in the affirmative, but also stressed the importance of economising in their use.

Fluorescent paint is the subject of a series of experiments by London Transport, made with a view to aiding travellers in the black-out. Bullseye signs, stair risers, and indication strips at the entrance to certain Underground stations have been treated with the paint, the use of which may be extended if the tests are successful.

Persons desirous of purchasing rosin, turpentine, or pine oil from the Ministry of Supply must make a written application on an approved form which can be obtained from the Ministry's Agents, the United Kingdom Naval Stores Association, Ltd., 106 Fenchurch Street, London, E.C.3. Buyers of quantities of less than 1 drum or barrel (as imported) should apply to their usual supplier.

At a luncheon held on Tuesday to celebrate the 50th anniversary of the Institution of Mining and Metallurgy, Sir William Bragg, P.R.S., spoke of the effect of the scorched earth policy on metal supplies. The working out of processes for the production of articles from new alloys was the metallurgist's chief joy, he said. Mr. E. H. Clifford, presiding, said that we had an adequate supply of nearly all the non-ferrous metals, thanks to the Royal Navy and the Mercantile Marine.

For the modest price of fourpence industrial chemists may now obtain a complete modern English bibliography of industrial chemistry, thanks to the activities of the Society of Chemical Industry and the National Book Council. The latter body has just published its " Book List 177 " on the subject. This is divided into one general and 23 special sections, covering all branches of industrial chemistry, and includes two especially full sections on " Fuels, Mineral Oils, Gas, and Tar " and " Metals, Metallurgy, and Electrometallurgy."

The opening article of the new volume of the *Journal of Scientific Instruments* is a survey, by the Institute of Physics, of recent American Developments in Experimental Physics. This valuable illustrated summary has again been contributed by Dr. C. J. Overbeck, of the Northwestern University, Evanston, Ill. Among interesting developments reported are: lubrication by thin metallic films, an inexpensive substitute for the cathode-ray oscillograph, and a suggestion for a new length standard.

The 1941 edition of the Official Directory of the British Chemical Plant Manufacturers' Association, contains all the customary features associated with it, such as the directory of members, classified list of products and services, proprietary and trade names and marks, etc. In addition to maintaining the style of the directory, however, there is an increase of 20 pages on the last pre-war issue. The Association will continue to supply copies, free of cost, to those genuinely interested in the purchase of British chemical plant, on application to 166 Piccadilly, London, W.1.

In the £20,000 waste paper contest, all paper collected in the various boroughs counts, whether it be garnered by the Local Authority, W.V.S., Boy Scouts, or privately, or handed to dustmen, or sold to merchants. Those merchants will provide each council with a statement of the total of waste paper collected in their borough during the drive. In Westminster 3/5ths of the total result achieved during their special Waste Paper Week was collected by waste paper merchants.

The china-clay district of St. Austell has raised £220,000 in connection with its warship week effort, a satisfactory result considering the very few markets now open to the industry. Now in the third year of the war, the china-clay trade has reached almost the lowest level since commercial development made it one of the important industries of the kingdom. It is not possible to give even an approximate idea of the clay produced or consumed, but it is probable that the home market, formerly the smallest consumer, has now become the largest.

Foreign News

The output of copper in Chile continues to increase, and the number of miners in this industry is now about 23,000. There is every reason to expect that exports for 1941 will reach record figures, since shipments up to the end of August totalled 284,584 metric tons, or 8358 tons more than in the first eight months of 1937, when the highest figures so far were registered. The tonnage for coal production is the highest yet attained.

In conformity with the policy of stricter control in Canada over many products, a Zinc Oxide Committee which includes all principal producers and distributors of that product has been formed by the Metals Controller to allocate supplies for the most essential purposes. Aluminium powder is being rationed, and aluminium paint will be available only for the aircraft, munitions and shipbuilding industries after stocks on hand have been sold.

By the reaction of an aldehyde with sulphanilamide, a patent assigned to the Farastan Co. of Philadelphia, claims to produce a sulphonamide derivative more potent against streptococcal and staphylococcal infections than those at present in use. The synthesis is simple, but the aldehyde used must have from 8 to 18 carbon atoms; in one example caprylic aldehyde is reacted with the sulphanilamide, producing the new compound alkylidene disulphanilamide.

An increased use of lead-silver alloys is envisaged in America owing to the fact that only about 18,000 tons of the tin to be smelted in the States comes from sources unaffected by the war. Mr. W. H. Tait, technical development manager, of the Tin Research Institute, has pointed out that these alloys, containing about 2½ per cent. silver, are no more expensive, make strong joints and require only the usual fluxes, but they require a much higher working temperature.

Forthcoming Events

The first of the series of Cantor lectures this year will be on the subject of " Soil Physics: Theory and Practice," and will be delivered by Dr. B. A. Keen, D.Sc., F.R.S., Deputy Director, Rothamsted Experimental Station, at the **Royal Society of Arts,** John Adam Street, Adelphi, W.C.2, beginning at 1.45 p.m. on **January 19, 26,** and **February 2.**

Mr. James Kewley, M.A., F.I.C., M.I.Chem.E., M.Inst.P., will deliver a lecture entitled " Evolution in the Petroleum Industry " before a meeting of the **Royal Society of Arts,** John Adam Street, Adelphi, W.C.2, on **January 21,** at 1.45 p.m.

Short papers on topical subjects will be presented before a meeting of the Birmingham and Midlands Section of the **Society of Chemical Industry,** on **January 23,** at 4 p.m., in the Chamber of Commerce, Birmingham.

Edinburgh and East of Scotland Sections of the **Society of Chemical Industry** and **Institute of Chemistry** will meet on **January 28,** at 7.30 p.m., at the North British Station Hotel, Princes Street, Edinburgh, to hear Professor R. D. Haworth speak on " Synthetical Investigations in the Natural Resin Field."

Personal Notes

MR. F. D. ASCOLI, Deputy Controller, has been appointed by the Minister of Supply to be Rubber Controller.

LORD DUDLEY GORDON was nominated president of the Federation of British Industries for the third successive year at the meeting of the Grand Council last Wednesday.

MR. A. H. TAYLOR and MR. D. HICKS, of the D.S.I.R., are in Ireland studying the production of peat as a possible means of supplementing coal supplies.

MR. A. N. E. MCHAFFIE has been appointed secretary of the British Thomson-Houston Company in succession to Mr. Fraser, who retired at the end of last year.

At the inaugural meeting held in London on January 14, MR. HARRY BARNARD was elected president of the National Association of Non-Ferrous Scrap Metal Merchants, and MR. MALCOLM GARNHAM, vice-president.

MR. ALBERT VAN DEN BERGH, chairman of Van den Berghs and Jurgens, Ltd., has retired after 48 years' association with the firm. He is succeeded as chairman by his son, MR. J. P. VAN DEN BERGH.

BRIG.-GEN. E. G. WACE, C.B., D.S.O., has retired from his post of managing director of Colas Products, Ltd., asphalt and bitumen manufacturers. He has been succeeded by MR. T. W. MATHIAS, hitherto sales director.

MR. L. G. FISHER, who was lent by Lever Brothers and Unilever, Ltd., to the Ministry of Supply to organise a Directorate of Sundry Materials, has returned to the company on completion of his task.

MR. H. B. BUSH has been appointed a managing director of W. J. Bush & Co., Ltd., London, while MR. C. F. BUSH and MR. A. J. MCINTYRE have been appointed directors. MR. D. E. ARNOLD, F.C.I.S., has been appointed secretary to the company.

MR. EUGENE G. GRACE, president of the Bethlehem Steel Company, United States, has been awarded the Bessemer Gold Medal for 1942 by the Council of the Iron and Steel Institute, in recognition of his valuable services to the iron and steel industries, and of his work in fostering technical, scientific, and industrial collaboration between the industries in Great Britain and the United States.

Obituary

DR. WALTHER NERNST, one of the most famous physical chemists of the age just past, died at Muskau, Silesia, on November 18, aged 77, according to reports that have reached us. His brilliant researches included contributions to the theory of solution, work on galvanic cells and metal-filament lamps, and on the Third Law of Thermodynamics. A native of Briesen (West Prussia), he founded the Institute of Physical Chemistry at Göttingen (where he was Professor of Physics), and in 1925-33 he was Director of the Institute of Physics at Berlin University. In 1920 he received the Nobel Prize for Physics and in 1928 the Medal of the Franklin Institute.

New Control Orders

Essential Oils and Turpentine

FROM January 15 the Open General Licence permitting importation without separate licences of essential oils, natural or synthetic, including terpeneless oils, and mixtures thereof, from the British Empire, Palestine and Transjordan, the Free French Colonies, the Belgian Congo, and Ruanda-Urundi is revoked. From that date separate licences will be required, but this will not apply to goods despatched to the United Kingdom before January 15, 1942, and imported into the United Kingdom before March 15, 1942. Revocation of the Open General Licence has the effect also of making turpentine subject to licence on importation from any country except Eire.

Applications to import essential oils from the above countries should be made on the standard form obtainable from the Import Licensing Department, Board of Trade, 1-6 Tavistock Square, London, W.C.1, or from the offices of the Collectors of H.M. Customs and Excise, and sent to the Import Licensing Department.

Magnesium Scrap

The Control of Magnesium (No. 3) (Scrap) Order, 1941 (S.R. & O. 1941, No. 2135) prohibits the use, treating, and consumption of any magnesium scrap or magnesium alloy scrap, except by converting it into either unfabricated magnesium or unfabricated magnesium alloy, or under licence, etc. Furthermore no smelter or refiner shall acquire the scrap or alloy except under similar authority. The order came into force on January 2.

Control of Bichromates

The Control of Bichromates (No. 1) Order, 1941 (S.R. & O. 1941, No. 1818) controls the price of commercial-grade sodium and potassium bichromate in quantities *of not* less than 1 cwt. The words in italics were inadvertently omitted in the original official notice.

British Chemical Prices

Market Reports

A VERY firm tone continues to be maintained in the industrial chemicals market, and reports from nearly all sections indicate a fairly widespread activity. Makers' deliveries to the consuming industries are going forward with regularity and fairly substantial quantities are covered. The price position remains unaltered, although scarcity of supplies still persists in some directions, and in consequence quotations are frequently irregular. The demand for lead oxides has been steady, and a good inquiry has been circulating for the heavy acids and the potash and soda compounds. A quiet tone has been in evidence in the coal tar products market during the past week, with movements chiefly centering round contract deliveries. Solvent and heavy naphthas continue firm, and there is a good demand for both grades of xylol.

MANCHESTER.—Traders on the Manchester chemical market during the past week have reported a fairly steady movement into consumption of a wide range of products for the textile and allied trades on their war-time basis of consumption, whilst the demand for most other leading consuming industries continues on steady lines. Much of the current business is against existing commitments, though there is no lack of fresh inquiry in circulation. Values generally are very strong. In the case of the tar products new business is still smaller in the aggregate than it was a short time ago, but in most sections traders are experiencing a steady flow of delivery instructions and good quantities of the light as well as many of the heavy materials are being taken up against contracts.

GLASGOW.—In the Scottish heavy chemical trade business has remained quiet since the beginning of the year, both for home and export business. Prices are very firm and, in many cases, an increase has taken place from the first of the month.

Price Changes

Antimony Sulphide.—Golden, 1s. 2d. to 2s. 2d. per lb. Crimson, 2s. 6d. to 2s. 7d. per lb.

Calcium Acetate.—MANCHESTER: Grey, £25 to £26 per ton.

Carbon Black.—5½d. to 7⅝d. per lb., according to packing.

Chromic Acid.—1s. 3d. per lb., less 2½%, d/d U.K.

Citric Acid.—1s 5½d. per lb., nominal; imported material, 1s. 10d. per lb. MANCHESTER: 1s. 8d. per lb.

India Rubber Substitutes.—White, 6½d. to 9½d. per lb.; dark, 5 9/16d. to 6 3/16d. per lb.

Potassium Permanganate.—B.P., 1s. 10d. per lb. for 1 cwt. lots; for 3 cwt. lots and upwards, 1s. 9½d. Tech., £7 18s. 6d. to £8 10s. 6d. per cwt., d/d, according to quantity.

Vermilion.—Pale or deep, 13s. 8d. per lb. for 30-lb. lots.

Production of casein in New Zealand is expected to fall to about 400 tons in 1941-42. This decline is said to be due to two factors: unprofitableness of production and stimulation of cheese production, cutting the supply of available materials. At present only one concern is producing casein and its output is gauged to meet domestic needs only—about 400 tons annually. Exports were about 500 tons during the first seven months of 1941. Stocks on hand are low.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Satisfaction

SILICATE CO., LTD., Hemel Hempstead, manure manufacturers. (M.S., 17/1/42.) Satisfaction, December 19, £1600, registered September 19, 1907.

Company News

Sangers, Ltd., report an interim dividend on ordinary shares of 5 per cent. (7½ per cent.).

English Clays Lovering Pochin and Co., Ltd., announce a net profit for 1941, after taxation, of £61,676 (£96,711), and have declared a dividend of 1 per cent. (1½ per cent.).

The directors of the **Midland Bank, Limited,** report net profits for 1941 of £1,969,288 (£1,933,093), and recommend a dividend, payable on February 2, for the half-year ended December 31, of 8 per cent., less tax, again making 16 per cent. for the year.

Michael Nairn and Greenwich (which owns a controlling interest in Michael Nairn and Co.), announce a net profit of £146,919 (£186,773), and the final dividend is maintained at 8½ per cent., again making 12½ per cent. for the year, but no bonus is forthcoming, as against 1½ per cent. for 1940.

The Electrolytic Zinc Company of Australasia, Ltd., announce an interim dividend of 4 per cent. (6 per cent.) for the six months ended December 31, on the ordinary and preference shares of the company. A dividend of 1 per cent. has also been declared on the new £1 ordinary shares.

New Companies Registered

E. M. P. Engineering Co., Ltd. (371,660).—Private company. Capital: £1000 in 1000 shares of £1 each. Electro or electro-chemical depositors of metals and alloys, mechanical, electrical and general engineers, etc. Directors: C. Wright and D. G. Wright. Registered office: 3 Victoria Street, S.W.1.

Metropolitan Plastics, Ltd. (371,784).—Private company. Capital: £100 in 2000 shares of 1s. each. Manufacturers of and dealers in plastic goods, moulding powder, resin, synthetic resin, varnish and paint, etc. Directors: D. Jacques, F. H. Lambert. Registered office: 16/17 Devonshire Square, E.C.2.

Lewis Laboratories, Ltd. (371,528).—Private company. Capital: £500 in 500 shares of £1 each. Manufacturers of and dealers in chemicals, galenicals, plasters, disinfectants, fertilisers, colours, glues, varnishes, laboratory reagents, etc. Directors: D. Lewis, J. Lester. Registered office: Vinces Chambers, Victoria Square, Leeds.

J. Goodman (Chemicals), Ltd. (371,493).—Private company. Capital: £1000 in 1000 shares of £1 each. Manufacturing chemists, wholesale druggists, importers, exporters, drug grinders, manufacturers of and dealers in chemicals for pharmaceutical, technical, electrical, photographic and scientific purposes, etc. Directors: J. Goodman and H. Goodman. Registered office: 9a Ladbroke Grove, W.11.

Antiseptic Products, Ltd. (371,653).—Private company. Capital: £8000 in 7000 6 per cent. redeemable cumulative participating preference shares of £1 each, and 10,000 ordinary shares of 1s. each. Manufacturing chemists, manufacturers of and dealers in pharmaceutical, aseptic and other preparations and disinfectants, etc. Directors: A. J. Bateman; H. J. T. McCarthy. Registered office: 271 High Road, Willesden Green, N.W.10.

Molybdenite (MoS_2) has been found to be a good lubricant by Westinghouse chemists in the U.S.A. They used it in X-ray tubes in which the anode is spun in order to expose different areas to the exciting rays and so avoid overheating. Oils and greases could not be employed because they would evaporate and ruin the vacuum, but the laminated crystal structure of the molybdenite was found suitable.

The deposit of livingstonite, a rare mixed sulphide of mercury the antimony, which has been worked more or less intermittently at Huitzuco, Mexico, since 1876 (regularly since 1934) is reported to be on the verge of exhaustion. Without additional discoveries production at the present rate (about 3200 tons of ore treated per month) can be maintained for only one more year. Prospecting for new deposits has not been encouraging.

Chemical and Allied Stocks and Shares

ALTHOUGH sentiment in Stock Exchange markets came under the influence of the war news from the Far East, security values were again slightly higher on balance in many directions. British Funds and leading investment stocks were reported to be in increased demand, but the war news from Malaya tended to check activity in industrial shares, which at the time of writing have experienced a little profit-taking. Nevertheless, although best prices made in the past few days have not been maintained, the majority of leading industrial shares are firmly held owing to willingness to take a long view, and in some instances they have remained in short supply in the market.

Securities of prominent companies playing a vital part in the war effort were again favoured, and those of leading concerns in the chemical and allied industries were slightly better on balance. At the time of writing Imperial Chemical are 33s. 3d. which compares with 33s. a week ago, while the 7 per cent. preference units, which are well covered as to dividend, have improved from 34s. 7½d. to 35s. Lever and Unilever, which remained under the influence of market hopes that improvement in the dividend may be in prospect, have rallied further from 30s. to 31s.; and the various preference shares were firm, the 8 per cent. being quoted at 29s. On the other hand, Nairn and Greenwich have moved back from 60s. to 57s. 6d., on the reduced distribution, and elsewhere Barry and Staines declined a few pence to 33s. 6d. In other directions, British Plaster Board 5s. shares were again active, and although best prices were not held, they were again higher on balance for the week at 22s., compared with 21s. 3d. There was a better tendency in Associated Cement, which improved 1s. 3d. to 52s. 6d., and also in British Cement shares at 82s. 6d., compared with 81s. 3d. B. Laporte were 63s. 6d., and Fison Packard 36s. 10½d.; but quotations were probably tested by few dealings. Borax Consolidated deferred remained a firm feature at 30s. 6d., aided by market hopes that the dividend may be kept on a 7½ per cent. basis. On the other hand, Amalgamated Metal shares moved down to 16s. 6d. United Molasses lost part of an earlier further gain, and were 31s. as compared with 31s. 6d. a week ago, but elsewhere there was continued buying of the units of the Distillers' Co., which recorded a further good rise from 73s. 3d. to 75s. 9d. A steady tendency was shown in British Match shares at 34s. 6d.

Triplex Glass 10s. ordinary were favoured and were higher at 31s. 10½d. Moreover, on further consideration of the annual report, Turner and Newall have now moved up to 70s. 7½d., which compares with 68s. 1½d. a week ago. Dunlop Rubber have been reactionary in the past few days, but on balance for the week were better at 32s. 6d. compared with 31s. 3d. A steady tendency was shown by British Aluminium at 45s. 3d. and by British Oxygen at 67s. 6d. Among iron and steel issues, Dorman Long were little changed at 19s. 9d., awaiting the dividend announcement, while Stewarts and Lloyds were 46s. 3d., and Tube Investments 86s. 3d. There was again a fair amount of activity in shares of companies connected with plastics, British Industrial Plastics 2s. ordinary being slightly higher at 3s. 4½d., while Erinoid 5s. ordinary improved from 7s. 9d. to 8s.

Boots Drug had a steady appearance at 36s. 3d., but Sangers moved back 1s. 6d. to 17s. 6d. on the reduced interim dividend. Timothy Whites were 21s. 6d., and Beechams Pills deferred 10s. 7½d. Business at 25s. 6d. was recorded in British Drug Houses. Cotton textile issues were favoured and were again higher on balance, Bradford Dyers being 10s. 3d., and the preference shares 16s., while Calico Printers ordinary and preference were 7s. 9d. and 14s. 9d. respectively. Elsewhere, Greeff-Chemicals Holdings 5s. ordinary were 5s. 7½d. Monsanto Chemicals 5½ per cent. preference remained at 22s. 6d. "Shell" and most other leading oil shares were reactionary.

The Polish dyestuffs factory "Boruta" at Lodz has been taken over by I.G. from the Government administrator who has been in charge since 1939. Besides dyestuffs, the production programme includes many intermediates and chemical auxiliaries for the textile trade, and important extensions are to be carried out.

APPOINTMENTS VACANT

ASSISTANT Works Manager required, for chemical works; experience in chemical engineering an advantage. Write, giving full particulars to Foundry Services, Ltd., 285 Long Acre, Nechells, Birmingham, 7.

FEMALE Laboratory Assistant required for preparation of inorganic chemicals. Applicants should have reached Inter B.Sc. or similar standard. Write stating age, experience, etc., to Box No. 633, A.K.Advg., 4 Talbot Mans., Museum Street, W.C.1.

PHYSICIST required for large N. London valve factory. Degree in Physics or Electrical Engineering essential. Preferably experience in high vacuum physics or circuit design. Write stating age, experience and salary required to Box No. 638, A. K. Advg., 4 Talbot Mans., Museum Street, W.C.1.

APPOINTMENT WANTED

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UNIVERSAL Horizontal Revolving Drum Mixer continuous action, no stopping while charging or emptying, 100 cube feet or 50 cwts. capacity. Nicholson Double Glue or Bone Crusher, 7½ in. wide, steel cutters. Three Disintegrators. Booth, Barron, and Impact Grinders. Automatic Packer for lime or cement. Gardner 24 in. by 9 in. Brush Sifter, 10 and 15 h.p. Slip Ring, A.C. Single phase Motors and Starters. Worm Screw Conveyors. Enclosed Bucket Elevators, etc. Edward Booth, Booth Street Mill, Congleton, Ches. Phone 375.

'Phone 98 Staines.

JACKETED Steel Mixing Pan, 5 ft. 0 in. by 3 ft. 0 in. diameter; Plain Mixing Pan, 5 ft. diameter, 3 ft. deep; Wood Vats, 9 ft. by 5 ft. 6 in. diameter; Filter Press, 5 Plates 18 in. square; several large Earthenware Containers.

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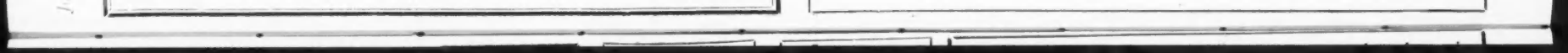

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